



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA CRC - U.S. EPA Region III
841 Chestnut Building (3HW02)
Philadelphia, Pennsylvania 19107

June 2, 1995

Ms. Brenda R. Norton, P.E.
Environmental Quality Division
Atlantic Division, Code 1822
Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, Virginia 23511-2699

RE: NWS Yorktown

Dear Ms. Norton:

Thank you for the opportunity to provide comments on the April 18, 1995 Summary of Background Constituent Concentrations and Characterization of Biotic Community from the York River Drainage Basin, for the Naval Weapons Station, Yorktown, Virginia. The following comments are made on behalf of the National Oceanic and Atmospheric Administration (NOAA).

Summary

The main objective of the study was to provide detailed information on background concentrations of trace elements and organic compounds in soil, groundwater, surface water, and sediment. Fish populations and benthic macroinvertebrate communities were also characterized in the ponds and streams chosen as background locations. Table 1 lists an overview of the sampling effort including media type, locations, number of stations, and types of analyses.

Surface soil, subsurface soil, and groundwater background samples were collected at NWS Yorktown. Surface soil sampling locations were divided into categories of "naturally occurring" and "anthropogenic" background. Naturally occurring surface soil samples were collected from five soil associations found at NWS Yorktown. Anthropogenic soil samples were collected along the railroad line parallel to Main Road. Reportedly, anthropogenic background surface soil samples were also collected at Sites 6, 7, 12, and 16, outside the area potentially impacted by the site. The results of the site-specific (Sites 6, 7, 12, and 16) surface soil sampling were not presented in this document, but will be presented in site-specific reports. Surface water, sediment, and biota were sampled at several off-site areas including York River State Park, Armed Forces Experimental Training Activity (AFETA) Camp Perry, Colonial National Historic Park, and the Catlett Islands.

The ranges of trace element concentrations in natural and anthropogenic soil samples, groundwater, and off-site surface water and sediment are listed in Table 2. Surface soil concentrations of trace elements in both natural and anthropogenic samples were within the ranges of concentrations of trace elements of the earth's crust (Lindsay, 1979). The values presented in Table 2 were for all surface soil samples; five soil associations were recognized, but concentrations were not broken out for Table 2. For the anthropogenic (railroad) surface soil samples, PAHs were detected at low concentrations (2,230 $\mu\text{g}/\text{kg}$ total PAHs), and pesticides, PCBs and nitramine compounds were below the detection limits used. Background groundwater samples contained low concentrations of arsenic, copper, and zinc; organic compounds were generally undetected, except for phenol (1 $\mu\text{g}/\text{l}$), phenanthrene (1 $\mu\text{g}/\text{l}$), delta-BHC (0.016 $\mu\text{g}/\text{l}$) and heptachlor epoxide (0.025 $\mu\text{g}/\text{l}$). Surface water from offsite freshwater and tidal freshwater streams contained low concentrations of trace elements; detections of semi volatile organic compounds and pesticides/PCBs were limited to chloromethane (1 $\mu\text{g}/\text{l}$) and heptachlor epoxide (0.058 $\mu\text{g}/\text{l}$). Surface water concentrations of copper in freshwater streams exceeded AWQC. Sediments from offsite freshwater and tidal freshwater streams contained generally low concentrations of trace elements; detections of semi-volatile organic compounds and pesticides/PCBs were limited to bis(2-ethylhexyl)phthalate (maximum 580 $\mu\text{g}/\text{kg}$). Maximum sediment concentrations of arsenic, copper, lead, mercury, nickel, and zinc in tidal freshwater streams exceeded their respective ERL concentrations. On-site freshwater ponds had trace element concentrations in surface water that were similar to the offsite streams. On-site pond sediments had trace element concentrations similar to offsite stream sediments; detections of semi volatile organic compounds and pesticides/PCBs were limited to bis(2-ethylhexyl)phthalate (maximum 870 $\mu\text{g}/\text{kg}$) and DDE (maximum 61 $\mu\text{g}/\text{kg}$).

A summary of fish and macroinvertebrates collected from on-site ponds and off-site streams is shown in Table 3.

Comments

Overall, the study met its objectives and provided good background data for comparison to impacted sites at NWS Yorktown. The sampling appears to have characterized background concentrations of trace elements and organic compounds in soils, groundwater, surface water, and sediments. The fish and benthic sampling should also provide a reasonable baseline for comparison to sites at NWS Yorktown. However, additional background and reference samples should be collected at the same time that potentially impacted sites are sampled because abundance and diversity of benthic communities and fish populations may vary considerably over time due to factors such as seasonal migration or emergence. Also, biota samples should be stratified by habitat type and physical parameters such as grain size and TOC for purposes of comparison.

Soil concentrations should be compared to background soils of the same soil association. Also, normalizing factors such as grain size, TOC, iron, or aluminum should be reported and used in comparisons of impacted to background soil concentrations.

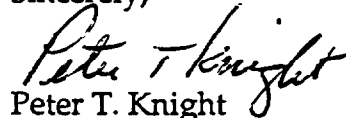
The greater the degree of variability, the greater the number of samples are required to support statistical tests at a given level of power and probability of alpha (page 3-3). By selecting aluminum specifically because of its low variability, the number of samples required has likely been underestimated. Additionally, if there are in fact differences among the five soil types, the number of samples required should have been 40 per soil type - not total.

Section 6.1.1 — Arsenic and manganese values do not appear to be elevated when compared to other efforts at describing "background" levels. The reason for the special attention these two elements received in this section is unclear. This section also fails to draw conclusions on whether the distribution of elements among the five soil types is different or not.

Section 6.1.2 — Despite third-party data validation, the authors still have decided to attribute detections of VOCs in the Anthropogenic Background samples to contamination. The rationale or evidence to support this claim should be provided in this report. Were similar observations made on the background samples, or were these detections limited to just those from impacted but not site-specific samples? Again, no efforts were made to distinguish these samples statistically from the others.

If you have any questions, please contact me at (215) 597-3636.

Sincerely,

A handwritten signature in black ink that reads "Peter T. Knight". The signature is written in a cursive, slightly slanted style.

Peter T. Knight
NOAA - Coastal Resource Coordinator

Table 1. Overview of background sampling effort.

Media	Location(s)	# Stations	Analyses
<u>Surface Soil</u>			
Naturally Occurring	NWS Yorktown	40	TAL Inorganic substances
Anthropogenic	Main Road/Railroad Line, NWS Yorktown	12	TAL Inorganic substances; TCL VOCs, SVOCs, pesticides/PCBs, nitramine compounds.
	Site-specific (Sites 6, 7, 12, 16), NWS Yorktown	5 - 10 at each site. Data were not available	TAL Inorganic substances; TCL VOCs, SVOCs, pesticides/PCBs, nitramine compounds.
<u>Subsurface Soil</u>			
Naturally Occurring	NWS Yorktown	13	TAL Inorganics, pH, TOC
<u>Groundwater</u>	NWS Yorktown	16 (11 new wells)	TAL Inorganics (total and dissolved), TCL VOCs, SVOCs, pesticides/PCBs, nitramine compounds, TDS, TSS, nitrates.
<u>Surface Water/Sediment/ Benthic Macroinvertebrates</u>			
Freshwater Ponds	Woodstock Pond, York River State Park, Powell Lake, AFETA Camp Peary.	4 2	Surface water and sediment: TAL Inorganics; TCL VOCs, SVOCs, pesticides/PCBs, nitramine compounds. Sediment: pH, TOC, grain size. Benthos: abundance, diversity.
Freshwater Streams	Colonial National Historic Park: Great Run, Baptist Run, Beaverdam Creek, Yorktown Creek (2)	5 Total	Surface water and sediment: TAL Inorganics; TCL VOCs, SVOCs, pesticides/PCBs, nitramine compounds. Sediment: pH, TOC, grain size. Benthos: abundance, diversity.
Tidal Freshwater Streams	Timberneck Creek, Catlett Islands.	6	Surface water and sediment: TAL Inorganics; TCL VOCs, SVOCs, pesticides/PCBs, nitramine compounds. Sediment: pH, TOC, grain size. Benthos: abundance, diversity.
	Taskinas Creek, York River State Park.	6	
<u>Fish</u>			
Freshwater Ponds	Woodstock Pond, York River State Park, Powell Lake, AFETA Camp Peary.	2 2	Taxonomy and general health assessment.
Freshwater Streams	Colonial National Historic Park: Great Run, Baptist Run, Beaverdam Creek, Yorktown Creek (2)	5 Total	Taxonomy and general health assessment.
Tidal Freshwater Streams	Timberneck Creek, Catlett Islands.	3	Taxonomy and general health assessment.
	Taskinas Creek, York River State Park.	3	

Table 2. Ranges of concentrations for detected chemicals in surface soils (mg/kg), groundwater (µg/l), surface water (µg/l), and sediment (mg/kg).

Chemical	Surface Soil		Ground-water (dissolved)	Freshwater Streams		Tidal-Freshwater Streams	
	Natural	Anthro-pogenic		Surface Water (dissolved)	Sediment	Surface Water (dissolved)	Sediment
Arsenic	0.46-64	1-15	3-5.5	4.7	0.27-5.4	1.2-13	1.4-13
Cadmium	1.3-1.5	ND	ND	ND	ND	5.3	ND
Chromium	2.6-18	3.5-34	ND	ND	2.8-33	ND	3.8-66
Copper	1.2-24	1.2-7.3	1.1-4	10-13	1-6.3	8.4-22	3.7-43
Lead	6.4-43	2.1-17	ND	ND	1.8-380	ND	3.4-52
Mercury	ND	0.05	ND	ND	0.06-0.09	ND	0.18-0.29
Nickel	3.8-12	4.2-13	ND	ND	4.6-18	18-52	9.3-55
Silver	1-2.1	1-1.8	ND	ND	ND	ND	2.2
Zinc	3.2-48	4.9-20	2.9-16	4-7.9	3.2-140	4.5	4-200

ND: Not Detected

Table 3. Fish species (common name), amphibians, reptiles, and macroinvertebrates (class and order) identified during the background investigation.

Location Type	Freshwater Ponds	Freshwater Streams	Tidal Freshwater Streams
Fish	American eel, black crappie, bluegill, golden shiner, largemouth bass, redear sunfish, painted turtle, pumpkinseed, and snapping turtle.	Eastern mudminnow, eastern mosquitofish, blacknose dace, and tadpole	Bay anchovy, Atlantic croaker, Atlantic menhaden, blue crab, blue gill, channel catfish, gizzard shad, grass shrimp, hogchoker, eastern mosquitofish, mummichog, rainwater killifish, sea robin, sheepshead minnow, spot, summer flounder, terrapin turtle, white catfish, and white perch
Macroinvertebrates	Oligochaeta and diptera	Bivalvia, oligochaeta, crustacea (amphipoda), and insecta (coleoptera, ephemeroptera, odonata, and diptera).	Bivalvia, oligochaeta, polychaeta, hirudinea, crustacea, and insecta (odonata, trichoptera, coleoptera, and diptera).